TEST DATA for H25DSS900TX

I. INTRODUCTION

These tests were conducted on a sample of the DSS900TX spread spectrum audio transmitter, for the purpose of demonstrating compliance with the requirements of Part 15 Certification and tested to Part 2 of Title 47 of the CFR. The DSS900TX transmitter is a Binary Phase Shift Keyed (BPSK) direct sequence spread spectrum intentional radiator with a rated output power of 50 mW. This device operates in the 902-928 MHz band.

All testing was conducted at DTC Communications, Inc.; 75 Northeastern Blvd., Nashua, NH 03062 with the exception of the radiated spurious testing, which was, performed at the OAT site at Retlif Laboratories Goffstown, NH facility. Retlif Testing Laboratories is listed by the FCC as a facility available to do measurement work for others on a contract basis.

II. INFORMATION REQUIRED FOR CERTIFICATION

Para.

2.10033(a) This Application for Certification is filed on form 731 with all questions answered. Confidentiality is being requested for the schematic. An application fee of $940 and a request for confidentiality of $135 is attached.

2.10033(b)(1) The full name and address of the applicant and manufacturer for certification is:

DTC Communications Inc.
75 Northeastern Blvd.
Nashua, NH 03062

(2) The FCC Identifier of the device is H25DSS900TX

(3) A copy of the operating instructions is included in the EXHIBITS.

(4) Circuit Functions and Operation

The DSS900TX is designed to operate as a portable direct sequence spread spectrum radiator in the 902-928 MHz band. The antenna is an integral patch, attached to the enclosure. This unit is battery powered. A description of the circuit functions follows:

The DSS900TX is a 900 MHz, low power, spread spectrum audio surveillance transmitter used for law enforcement applications. The transmitter employs digital modulation with direct sequence spread spectrum on one of three factory-selected channels. It has a power output of 50mW to an integral patch antenna built into the housing which meets the requirements of Part 15.203.

Two microphone modes are supported, internal and external. The microphone audio is processed by an amplifier equipped with an automatic gain control (AGC) which may be turned ON or OFF with an external switch. Audio is processed with a continuously variable slope delta-modulation (CVSD) speech coder at a rate of 32 Kbps.

The DSS900TX is powered by five AAA batteries, which supply a nominal 7.5 VDC. All critical circuits are regulated.

Necessary Bandwidth

This is a digitally modulated device. The modulation method is binary phase shift keying (BPSK) with direct sequence spreading based on a pseudorandom code. The occupied bandwidth is related to the coded voice data rate along with the number of spreading chips per bit and system filtering. The chips per bit times the data rate known as the chip rate or *code rate* is the dominant factor since it does the actual "spreading".

The audio data converter rate is 32 Kbps. The *effective* number of chips per bit is 11.

The code rate is the data rate times the chips per bit or 357.1 K chips per second (cps).

The necessary bandwidth calculation for the H25DSS900TX transmitter follows the general formula for direct sequence transmitters:

BW = 2 X code rate

Because of the use of a proprietary technique called recombinant spread spectrum (RSS), which improves fade resistance, the chip clock rate appears to be higher than 357.1 Kcps, actually 704 Kcps, so far as occupied BW is concerned. So the necessary bandwidth is:

BW = 2 (704 Kcps) = 1.4 MHz

Emissions Designator
Part 15 does not require an emissions designator.

A representative emissions designator is: 1M4G1D

This indicates that this is a binary phase shift keyed, single channel, digital transmission, with an occupied bandwidth of 1.4 MHz.

The actual bandwidth including major sidelobes, measured at the 6dB points, is just over 1 MHz. This bandwidth meets the requirements of §15.247(a)(2).

RF Radiation Exposure Evaluation

§15.247(4) states that systems shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commissions guidelines.

This transmitter employs a patch antenna, which radiates more than 80% of the RF energy away from the body. This fact coupled with the low average power, and limited mission time, insures that exposure levels are well below the SAR limits of §2.1093(1) and ANSI/IEEE C95.1-1992.

The instruction manual includes a description of how to properly mount the transmitter on the body, so as to minimize exposure and maximize outward radiation. In addition, the transmitter is equipped with a "This Side on Body" warning label as shown in the photo EXHIBITS.

(5) A block diagram of the device is included in the EXHIBITS.

(6) This Test Report includes tabular data and plots.

(7) Internal and external photographs of this device are included in the EXHIBITS.

(8) No peripherals, other than the external microphone, were involved in this evaluation.

(9) Certification under the transition provisions of Paragraph 15.37 is not being requested for this device.

(10) The Processing Gain of the DSS900TX exceeds 10 dB.

Processing Gain

Processing gain in a direct sequence spread spectrum transmitter is 10log (chips per bit).

$$10\log(11) = 10.4\text{dB}$$

This processing gain is more than 10dB and thus meets the requirements of Part 15.247(e).

The transmitter and receiver architecture, components provided by Digital Wireless Corporation, has been previously certified under Part 15 and has been found to provide an acceptable processing gain. See: FCC ID: 18WWRM91-50 for jamming measurements.

(11) N/A

III. TEST RESULTS

a) The minimum 6dB bandwidth per §15.247(a)(2) is given in Plot 1. This 1MHz-plus occupied bandwidth meets the minimum 500 kHz requirement for DSSS transmitters.

b) Peak power within the band 902 – 928 MHz has been measured with a spectrum analyzer. The results are given in Plot 2 – 4. The average power of the transmitter, as measured on a power meter was 0.056 W. This output power is below the 1 Watt limit of §15.247(b)(1).

c) Spurious emissions were measured over the frequency range of 30 – 9280 MHz per §15.247(c) as shown in Plot 5-8. Conducted spurious emissions are all greater than 50 dBc.

d) Per §15.247(d), the transmitter power spectral density averaged over a one -second interval in a 3 kHz band is given in Plot 9. The -.75 dBm peak level is well below the + 8 dBm limit.

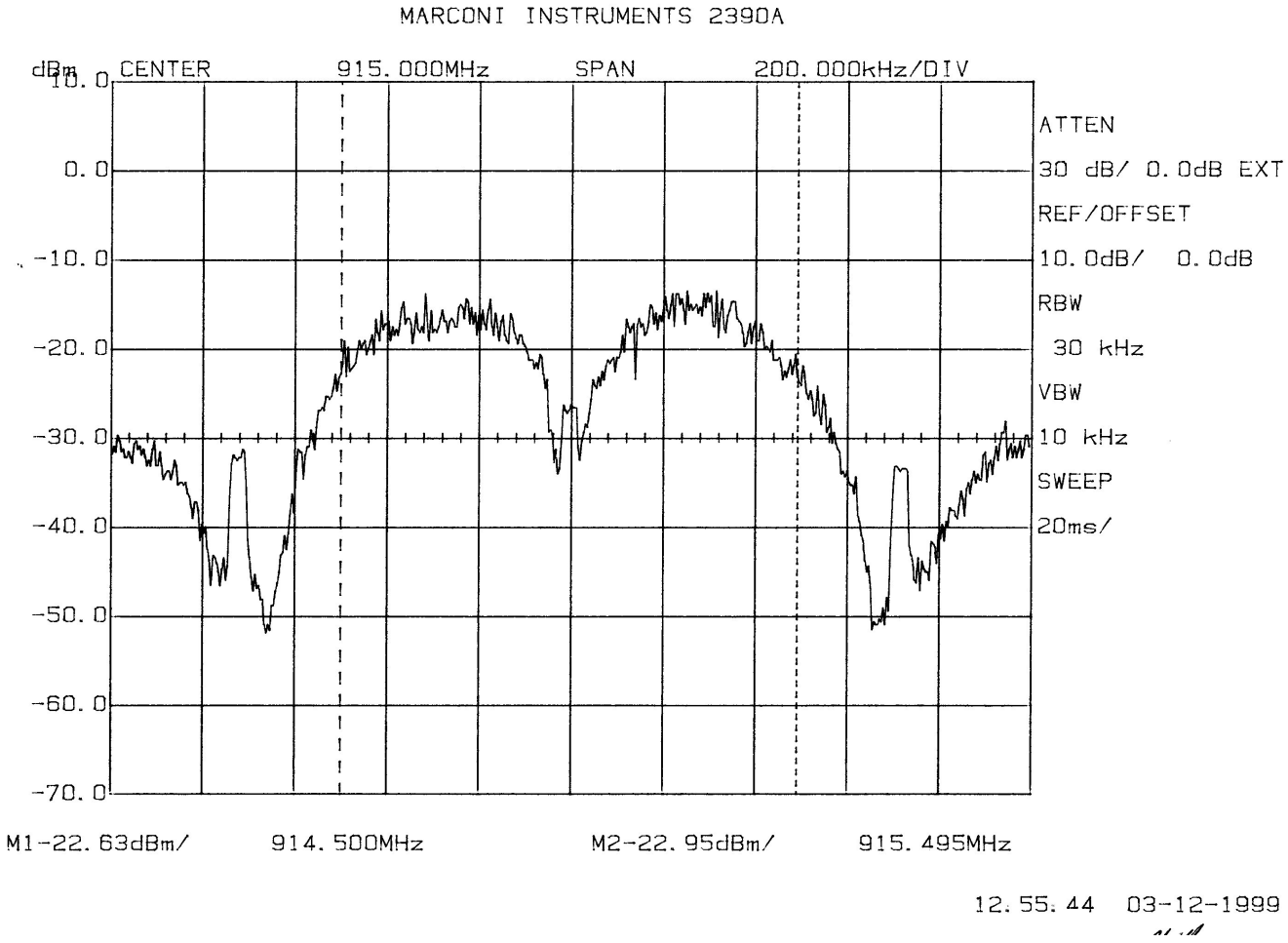
e) Conducted voltage measurements per §15.207(a), N/A – this is a portable, battery operated device.

f) Radiated field strength measurements were taken in the range 30 MHz – 1000 MHz per §15.109(a). This testing was performed by Retlif Labs. at their Goffstown, NH site. A complete test report is attached which includes test photographs and a test equipment list. All correction factors are included in the measurement results. All detected spurious emissions were within the limits.

a. Minimum 6 dB Bandwidth

This measurement was done with 20 dB of external attenuation between the test sample and the spectrum analyzer. The integral antenna connection was removed from the transmitter output and a test cable pigtail was substituted. This bandwidth (1 MHz), is greater than the minimum 6dB bandwidth of 500 kHz required by §15.247(a)(2).

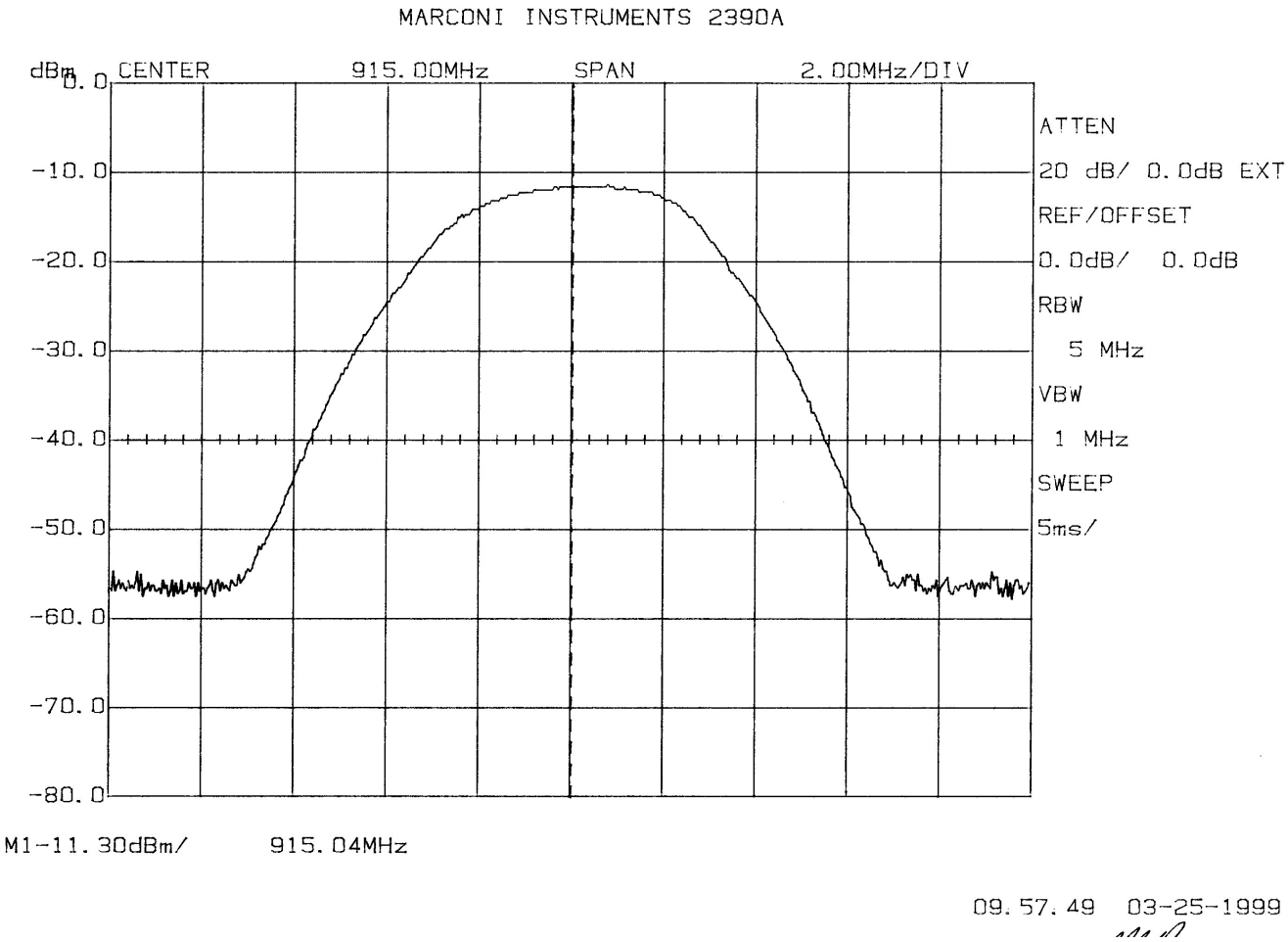
Plot 1 Minimum 6dB BW



b. Peak Power Measurement

The peak power measurement was made with 31 dB of attenuation between the test sample and the spectrum analyzer. Thus the peak output power is –11.3 dBm + 31 dB = 17.7dBm or .0589 W. This is lower than the maximum peak output power of 1 Watt, permitted for all direct sequence systems under §15.247(b)(1).

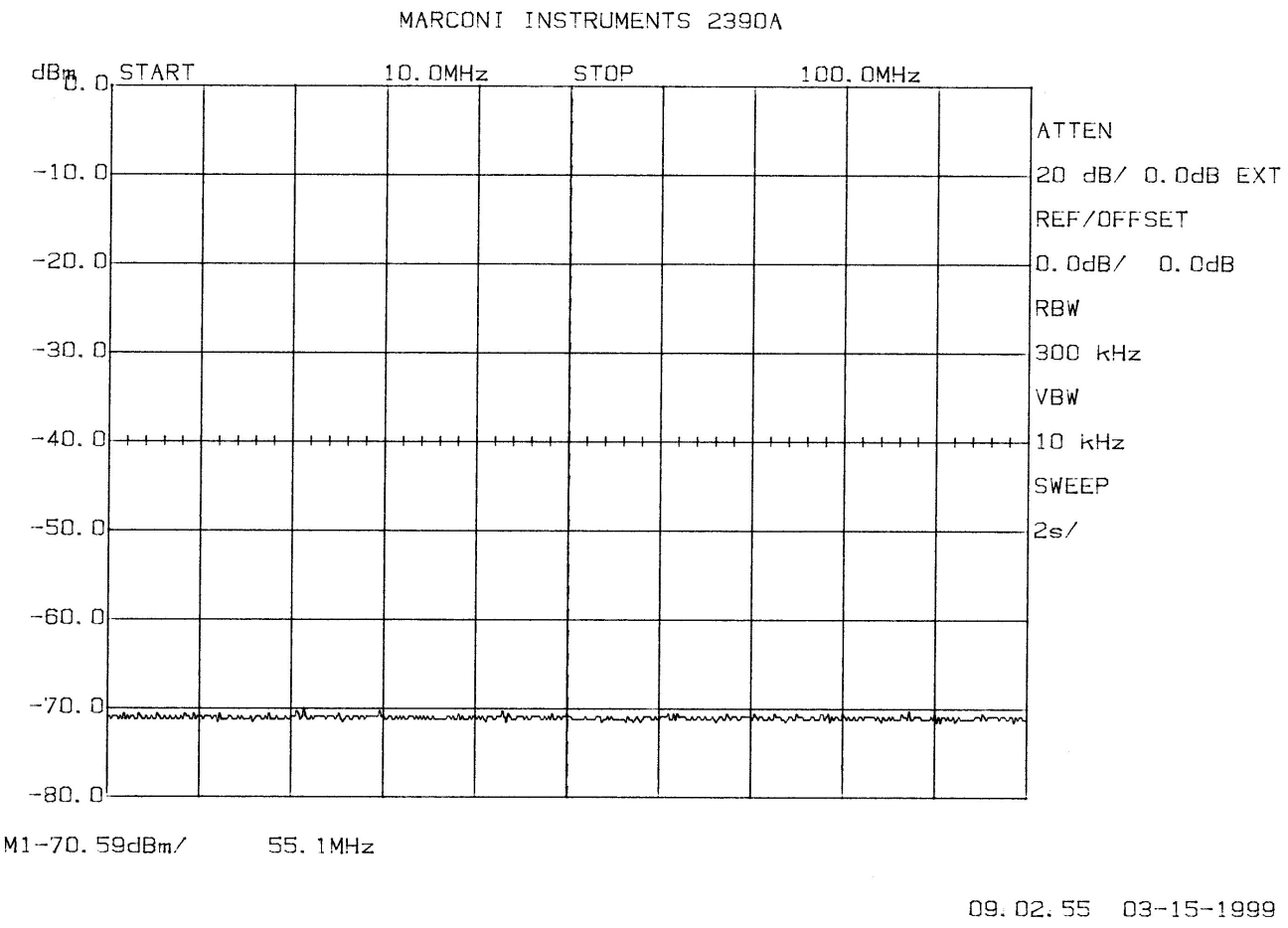
Plot 2 Peak Power



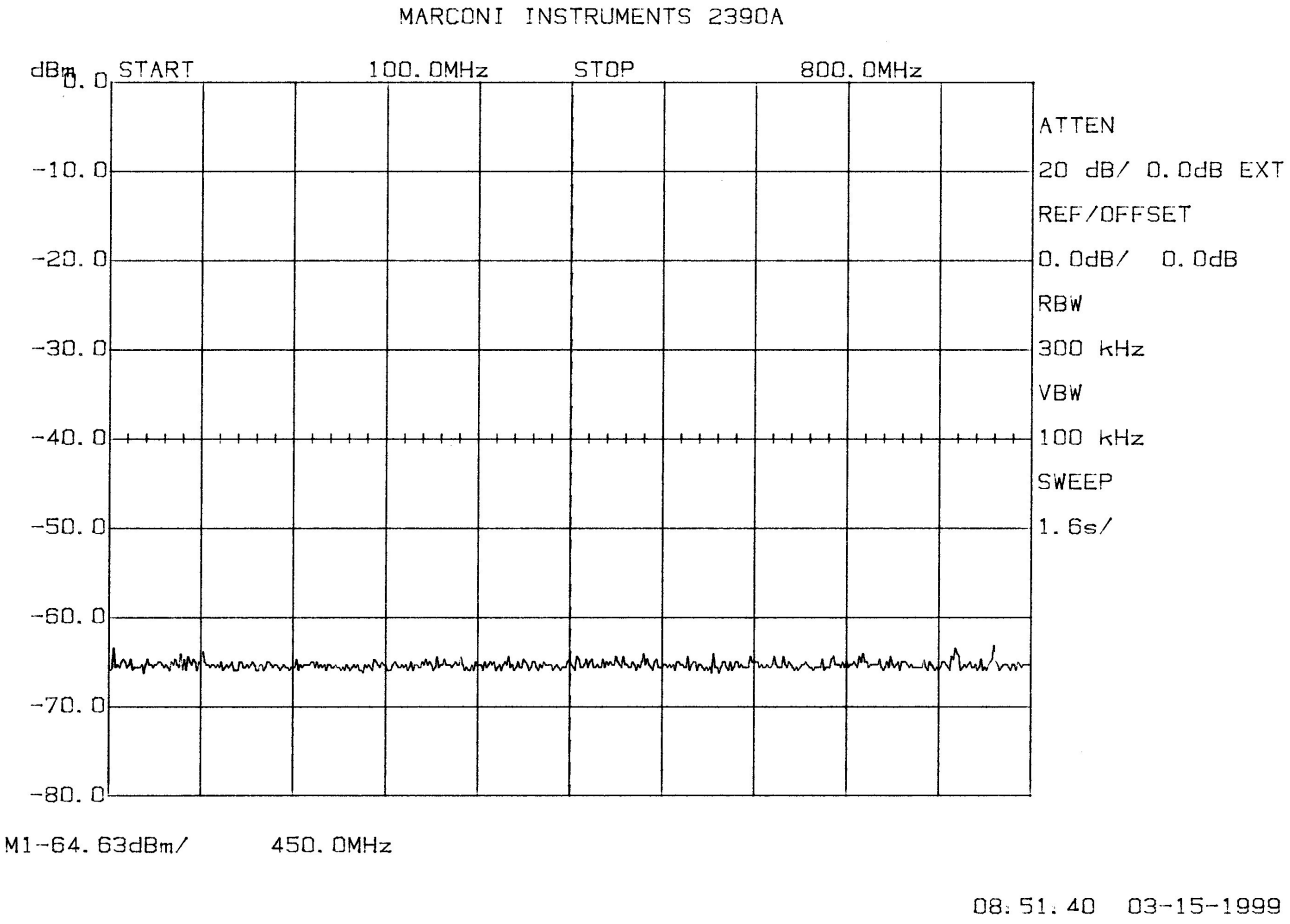
c. Spurious Emissions

Conducted spurious emissions were done with a measured 20 dB of attenuation

Plot 3 Spurious Emissions



Plot 4 Spurious Emissions



Plots 5 and 6 Spurious Emissions